REMARKS

By this Amendment, Applicant has canceled claims 3, 6, 7, 10, 11, 13-15, 17-19, and 21-25, without prejudice or disclaimer; and amended claims 1, 2, 4, 5, 8, 9, 12, 16, and 20. No new matter has been added. Claims 1, 2, 4, 5, 8, 9, 12, 16, and 20 are pending.

In the Office Action, the Examiner rejected claims 20 and 25 under 35 U.S.C. § 112, second paragraph; rejected claims 1-25 under 35 U.S.C. § 103(a) as being unpatentable over Cameron (U.S. Patent No. 5,363,196) in view of Nishi (U.S. Patent No. 6,486,955); and provisionally rejected claims 1-25 under 35 U.S.C. § 101 as claiming the same invention as co-pending U.S. application no. 09/883,296.

With respect to the provisional rejection of claims 1-25 under 35 U.S.C. § 101, Applicant has allowed U.S. application no. 09/883,296 to become abandoned as of January 9, 2004. Therefore, Applicant respectfully requests reconsideration and withdrawal of the provisional §101 rejection of claims 1-25 based on U.S. application no. 09/883,296.

With respect to the rejection of claims 20 and 25 under 35 U.S.C. § 112, second paragraph, Applicant has amended claim 20 and canceled claim 25 without prejudice or disclaimer.

With respect to claim 20, the Examiner asserts that "[i]t is unclear what 'the pairs of first, second, third, and fourth locations' are," and that "in the fourth clause, it is unclear if there are numerous 'second locations' and 'fourth locations.'" Office Action at 2. Applicant has amended claim 20 to recite, in pertinent part, "first, second, third and fourth adjacent pairs of locations. . .," thereby clarifying claim 20 without narrowing

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its scope. Therefore, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 20 and 25 under 35 U.S.C. § 112, second paragraph.

In the Office Action, the Examiner rejected claims 1-25 under 35 U.S.C. § 103(a) as being unpatentable over Cameron in view of Nishi. Following Applicant's Amendment, claims 1, 12, and 20 are the only pending independent claims. With respect to each of those claims, Applicant respectfully traverses the rejection of claims 1, 12, and 20 based on the Examiner's hypothetical combination of the Cameron and Nishi references because the Examiner has failed to establish a *prima facie* case of obviousness.

In order to establish a *prima facie* case of obviousness, among other things, "the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. § 2143. Because the Cameron and Nishi references, taken singly or in combination, fail to disclose all of the limitations of each of independent claims 1, 12, and 20, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness.

Applicant's invention as recited in amended claim 1 is directed to a measurement system for determining the tilt of a reflective object mounted to a support, including, among other recitations, "first, second, third and fourth sensors, each capable of generating data indicative of a distance between the first, second, third or fourth sensor, respectively, and a reflective surface of the reflective object; and a controller for receiving inputs from the first, second, third and fourth sensors and determining a tilt of the reflective surface with respect to a z axis; wherein: the support has a generally planar surface that is generally perpendicular to the z axis but which may tilt with

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respect thereto, the reflective object is mounted to the support so that the reflective surface is in a plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis; . . . the controller determines a tilt of the reflective surface at a location ka along the longitudinally extending direction of the reflective surface[; and] the reflective surface can be incrementally moved to additional positions in multiples of a along the axis normal to the z axis along which the reflective surface extends longitudinally and additional measurement values for the sensors can be determined to arrive at a set of measurement values . . .; the controller determines a summation of the set of measurement values as

$\sum_{m=0}^{k-1} \Delta(ma) = \Phi(ka) - \Phi(0)$ and a tilt of the reflective surface at a location ka along the longitudinally extending direction of the reflective surface as

$\Phi(ka) = \Phi(0) + \sum_{m=0}^{k-1} \Delta(ma)$; the system further comprising at least one motor operatively mounted to said support to move said support, said reflective surface and said reflective object in the directions along which said reflective surface longitudinally extends, wherein said motor incrementally moves said reflective surface to measure displacement of said reflective surface out of said plane substantially parallel with the z axis at each incremental location." The Cameron and Nishi references, taken singly or in combination, fail to disclose or suggest at least that subject matter recited in Applicant's amended claim 1.

In the rejection statement, the Examiner asserts that the Cameron reference discloses "a generally planar surface that is generally perpendicular to the z axis but which may tilt with respect thereto (col. 4, lines 11-20)." Office Action at 3. Even if, for

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the sake of argument, the Cameron reference discloses what the Examiner asserts, the Cameron reference discloses that "because of the long, narrow aspect ratio of both "X" mirror surface 204 and "Y" mirror surface 206, determination of pitch and/or roll errors (twist) of the mirror surfaces may not be worth pursuing." Col. 6. lines 19-22. Furthermore, the Cameron reference explains that "experience has shown that the only significant departure from flatness and straightness of either mirror is normally just a slight concave or convex bowing of mirror length about one point of inflection." Col. 6, lines 23-26. In other words, the Cameron reference teaches away from measuring tilt.

Furthermore, although the Cameron reference may acknowledge that tilt can be measured, the Cameron reference does not disclose measuring tilt along a longitudinal plane and/or collecting tilt data measured along a longitudinal plane. Contrary to the Cameron disclosure, Applicant has found that measuring tilt along a longitudinal plane allows for an enhanced precision of alignment of the stage. Therefore, the Cameron reference does not disclose or suggest all of the subject matter recited in Applicant's amended independent claim 1.

Applicant's invention as recited in amended claim 12 is directed to an interferometric measurement system for determining the tilt of a reflective object mounted to a support, including, among other recitations, "an interferometer system having first, second, third and fourth laser beam generators, each capable of generating a laser beam to measure a distance between said first, second, third or fourth generator, respectively, and a reflective surface mounted to a support; and a controller for receiving inputs from said interferometer system and determining a tilt of said reflective surface with respect to a z axis, wherein the support has a generally planar

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surface that is generally perpendicular to the z axis but which may tilt with respect thereto, and wherein the reflective surface is in a plane substantially parallel with the z axis and longitudinally extends substantially parallel to an axis normal to the z axis; and wherein said controller determines a tilt of said reflective surface at a location ka along the longitudinally extending direction of said reflective surface[;]the reflective surface can be incrementally moved to additional positions in multiples of a along the axis normal to the z axis along which the reflective surface extends longitudinally and additional measurement values for the laser beams can be determined to arrive at a set of measurement values . . .; and the controller determines a summation of the set of measurement values as $\sum_{m=0}^{k-1}\Delta(ma) = \Phi(ka) - \Phi(0)$ and a tilt of the reflective surface at a location ka along the longitudinally extending direction of the reflective surface as $\Phi(ka) = \Phi(0) + \sum_{m=0}^{k-1}\Delta(ma)$; the system further comprising at least one motor operatively mounted to said support to move said support and said reflective surface in directions along which said reflective surface longitudinally extends, wherein said motor incrementally moves said reflective surface to measure displacement of said reflective surface out of said plane substantially parallel with the z axis at each incremental location." The Cameron and Nishi references, taken singly or in combination, fail to disclose or suggest at least that subject matter recited in Applicant's amended claim 12 for reasons at least similar to those outlined above with respect to claim 1.

Applicant's invention as recited in amended claim 20 is directed to a method of measuring tilt of a substantially planar surface with respect to a vertical axis, including, among other recitations, "providing a measurement system having the capability of

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measuring distances between first, second, third and fourth adjacent pairs of locations on the substantially planar surface and respective first, second, third and fourth adjacent pairs of locations on the measurement system, where the distances measured are along imaginary lines substantially perpendicular to the substantially planar surface; positioning the substantially planar surfaces surface such that the measurement system is near an end of the substantially planar surface; measuring distances between the pairs of first, second, third and fourth locations; subtracting the distance between the second locations from the distance between the fourth locations and dividing the difference by a distance between the second and fourth locations on the substantially planar surface to give a term J1; subtracting the distance between the first locations from the distance between the third locations and dividing the difference by the distance between the first and third locations on the substantially planar surface to give a term J2; and determining a tilt of the substantially planar surface at the location of the substantially planar surface[;] incrementally moving the substantially planar surface in a direction parallel to an axis normal to the vertical axis and away from the end of the surface by the distance a; measuring distances between the first, second, third and fourth locations on the measurement system and the respective four new locations on the substantially planar surface; subtracting the distance between the second locations from the distance between the fourth locations and dividing the difference by a distance between the second and fourth locations on the substantially planar surface to give a term J1; subtracting the distance between the first locations from the distance between the third locations and dividing the difference by the distance between the first and third locations on the substantially planar surface to give a term J2; and determining a tilt of

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the substantially planar surface at the new location incrementally removed from a previously measured location[;] incrementally repeating the method until an opposite end of the substantially planar surface is reached and no further incremental measurements can be taken, or until a predetermined length of the substantially planar surface has been measured; and determining a tilt of the substantially planar surface with respect to the vertical axis for any predetermined position ka according to the following formula:

$$\Phi(ka) = \Phi(0) + \sum_{m=0}^{k-1} \Delta(ma)$$

where: Φ(ka) is a measure of tilt of the substantially planar surface with respect to the vertical axis at position ka; Φ(0) is a measure of tilt of said second reflective surface at an initial measurement location near one end of said second reflective surface; and Δ(ma) is a measure of displacement out of said substantially planar surface, at locations where in = 0, 1, 2, ... k-1." The Cameron and Nishi references, taken singly or in combination, fail to disclose or suggest at least that subject matter recited in Applicant's amended claim 20 for reasons at least similar to those outlined above with respect to claim 1.

The other cited references, Strait (U.S. Patent No. 4,99,961), Tanimoto et al. (U.S. Patent No. 5,151,749), Slater (U.S. Patent No. 5,419,631), Masuyuki (U.S. Patent No. 5,638,179), Larsson (U.S. Patent No. 5,650,848), Nishi et al. (U.S. Patent No. 5,739,899), Kamiya (U.S. Patent No. 5,790,253), taken singly or in combination, fail to overcome the deficiencies of the Cameron and Nishi references.

Accordingly, Applicant respectfully submits that independent claims 1, 12, and 20 are allowable. Furthermore, Applicant submits that claims 2, 4, 5, 8, 9, and 16 are

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allowable by virtue of their dependency on claims 1 and 12, as well by their additional recitations of novel and non-obvious subject matter. Therefore claims 1, 2, 4, 5, 8, 9, 12, 16, and 20 should be allowable.

Applicant respectfully requests the reconsideration and reexamination of this application and the timely allowance of the pending claims.

If the Examiner believes that a telephone conversation might advance prosecution, the Examiner is cordially invited to call Applicant's representative at 571-203-2739.

Applicant respectfully submits that the Office Action contains numerous assertions concerning the related art and the claims. Regardless of whether those assertions are addressed specifically herein, Applicant declines to automatically subscribe to them.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account No. 06-0916.

Respectfully submitted,

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